REMARKS

This Application has been carefully reviewed in light of the Office Action mailed February 23, 2005. At the time of the Office Action, Claims 1-18 were pending in this Application.

Status of Parent Application

Similar rejections as are made in the present application were made in the prosecution of the parent application. In the parent application, a response with amendments and arguments similar to those presented herein was filed on May 3, 2005.

Rejections under 35 U.S.C. §102

Claims 1, 3, 9, 10, 12, and 18 were rejected under 35 U.S.C. §102(b) as being unpatentable over U.S. Patent 5,441,401 issued to Akira Yamaguro et al. ("Yamaguro et al.").

Claim 1 and its dependent claims

Claim 1 is directed to the embodiment of Figure 1. The main part of the accompanying description is on pages 5 - 7.

Claim 1 has been amended to recite additional particulars of the partial oxidation unit 10a. Its structure, location, and function are recited as well as the fact that it uses a heat generating means, such as a burner. The heat requirements of the partial oxidation unit 10a are described on page 6, lines 1-6, and page 8, lines 10-12.

As explained below, it is not obvious to modify the Stirling engine system of Yamaguro to arrive at the invention of Claim 1. The only embodiment of Yamaguro that has an "off-line" hydrogen generating device is the embodiment of Figure 3. Yamaguro's other embodiments generate hydrogen inside the combustion chamber, which is such a far cry from the present invention, that the Examiner does not seem to rely on them.

As has been previously discussed, Yamaguro's Stirling engine system is a low temperature system (Col. 2, lines 45-46). Yamaguro does not teach or suggest how his system would work in the much hotter environment of a diesel internal combustion engine. In fact, the invention of Yamaguro would *not* work because diesel internal combustion

engines have much higher operating temperatures. In further fact, Yamaguro teaches away from such use by stating that the operating range of his system is less than 250 degrees Centigrade (col. 2, lines 40-47; Figure 7).

The operating temperature of a diesel engine is well known in the art of engines. Anyone familiar with the operation of diesel engines knows that diesel fuel exhaust gases are typically in the temperature range of 250 - 450 °C. The Examiner's argument that 249.999 and 250.001 °C are essentially the same temperatures is not in question. However, the Examiner should note that the activity of Yamaguro's catalyst at 250°C is essentially zero. The activity is reasonable at 150°C, but drops rapidly such that at 200°C it is only 20% above the baseline activity. Therefore, Yamaguro's catalyst becomes essentially ineffective above about 175°C. The difference between 175°C and 250°C is not insubstantial, and cannot be ignored.

Yamaguro is explicit with respect to fuel type only when he uses liquid natural gas (LNG) as an example (col. 6, line 33). Yamaguro likely uses non-diesel fuels to achieve its low operating temperatures. In the present invention, it is significant that Claim 1 recites diesel fuel, which requires more heat to ignite than other fuels. It follows that the partial oxidation unit 10a of Claim 1 requires heat for oxidation (burning) of diesel fuel or "light off" of a catalyst.

To modify Yamaguro to match Claim 1, what type of hydrogen generating device 65 would be used? Would it work with diesel fuel? Would the hydrogen thereby generated be useful with diesel exhaust? Would it be sufficiently hot? Sufficient in amount? None of these questions are answered by Yamaguro.

Perhaps most importantly, Yamaguro does not teach or suggest that his hydrogen generating unit 65 includes a heat generator. In fact, Yamaguro teaches to the contrary. As explained above, the invention of Yamaguro is designed for low temperature engine environment. If a heater were installed at the hydrogen generating unit 65, the heat would dramatically affect the catalyst operation. Specifically, as shown in Figure 7 of Yamaguro, even a slight amount of additional heat at the catalyst inlet is detrimental to NOx conversion efficiency (col. 6, lines 20-24). If a heater were used to generate hydrogen, both the thermal

effects of the heater and the raised temperature of the mixed exhaust would raise the temperature shown in Figure 7 and lower the NOx conversion efficiency.

For the reasons above, Claim 1 is not obvious from Yamaguro. Claim 1 and its dependent claims are allowable. Claim 8 is cancelled.

Claim 10 and its dependent claims

Claim 10 is directed to the embodiment of Figure 2. The main part of the accompanying description is on pages 7 - 8. As explained therein, the embodiment of Figure 2 has a partial oxidation unit 10a that receives exhaust gas diverted from the main exhaust line. The partial oxidation unit 10a uses the heated air of the diverted exhaust and the diesel fuel to produce hydrogen.

In accordance with the description, Claim 10 has been amended to recite additional particulars of the partial oxidation unit. As explained below, the partial oxidation unit of Claim 10 is different in location, structure, and function, as compared to the "hydrogen-producing means" 65 of Yamaguro.

Yamaguro does not teach or suggest a means for heating the air entering his hydrogen generating unit 65 (Figure 3) or any other of his hydrogen generating means. As stated above, Yamaguro teaches a Stirling engine system that is characterized by low operating temperatures. He teaches away from the introduction of any additional heat in the exhaust or near the exhaust inlet (Figure 7; col. 6, lines 20-24).

For the reasons above, Claim 10 is not obvious from Yamaguro. Claim 10 and its dependent claims are allowable. Claim 17 is cancelled.

Rejections under 35 U.S.C. §103

Claims 2, 6, 11, and 15 were rejected under 35 U.S.C. §103(a) as being unpatentable over Yamaguro et al. in view of U.S. Patent 6,145,501 issued to Shailesh Sharad Manohar et al. ("Manohar et al.").

Claims 4,5,8,13,14, and 17 were rejected under 35 U.S.C. §103(a) as being unpatentable over Yamaguro et al. in view of U.S. Patent 5,543,124 issued to Koji Yokota et al. ("Yokota et al.").

The other references (Manohar and Yokoto) do not compensate for the deficiencies of Yamaguro. Manohar teaches the use of a burner and catalyst, but does not compensate for the fact that additional heat would be unacceptable in the engine environment of Yamaguro.

None of the cited references teaches or suggests the use of an exhaust bypass line to supply exhaust to a hydrogen generating device. Even if they did, the additional heat would be unacceptable in the engine environment of Yamaguro.

CONCLUSION

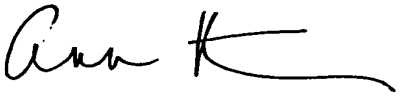
Applicants have made an earnest effort to place this case in condition for allowance in light of the amendments and remarks set forth above. Applicants respectfully request reconsideration of all pending claims.

Applicants enclose a Petition for One Month Extension of Time and a check in the amount of $65.00 for the extension fee. Applicants believe no other fees are due at this time, however, the Commissioner is hereby authorized to charge any fees to Deposit Account No. 50-2148 of Baker Botts L.L.P. in order to effectuate this filing.

If there are any matters concerning this Application that may be cleared up in a telephone conversation, please contact Applicants' attorney at 512.322.2634.

Respectfully submitted,

BAKER BOTTS L.L.P.
Attorney for Applicants



Ann C. Livingston
Reg. No. 32,479

SEND CORRESPONDENCE TO:
Baker Botts L.L.P.
CUSTOMER ACCOUNT NO. **31625**
512.322.2634
512.322.8325 (fax)

Date: 6/22/05